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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/680,260	10/08/2003	David William Abraham	YOR920030013US1	5657

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EXAMINER	
MAI, ANH D	

ART UNIT	PAPER NUMBER
2814	

DATE MAILED: 08/03/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/680,260	ABRAHAM ET AL.	
	Examiner	Art Unit	
	Anh D. Mai	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 July 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2 and 5-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2 and 5-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date [redacted].
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Status of the Claims

1. Amendment filed July 10, 2006 has been entered. Claims 3 and 4 have been cancelled. Claims 1, 6, 7, 15-20, 22, 24 and 25 have been amended. Claims 1, 2 and 5-26 are pending.

Information Disclosure Statement

2. The IDS submitted on July 10, 2006 citing a Non-Patent Literature. This particular paper have already been cited and considered in the Office Action mailed May 23, 2005.

Claim Objections

3. Claim 13 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

Claim 13 recites: further comprising producing a magnetic device.

Since the "producing a magnetic device" of claim 13 does not include any elements that narrows the device already formed by claim 1, claim 13, thus, **fails to further limit claim 1**.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 13 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 13, recites: the method of claim 1, further comprising producing a magnetic device.

What is the magnetic device ?

Is the device produced by claim 1 not a magnetic device ?

What is the difference between the magnetic device produced by claim 1 and that of claim 13 ?

Claim 13 recites "further comprising: producing a magnetic device" but without providing any other process steps that already recited in claim 1, thus, claim 13 is indefinite.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1, 2, 5-11, 13-15, 17, 19 and 22-26 are rejected under 35 U.S.C. 102(b) as being anticipated by Kamata et al. (U.S. Pub. No. 2002/0142192) of record.

With respect to claim 1, Kamata teaches method of patterning a magnetic thin film as claimed including:

transforming a portion of the magnetic thin film (20, 330, 350) to be non-magnetic and electrically insulating (40, 370) using a chemical transformation, the chemical transformation comprises using a fluorine-based reactive plasma. (See Figs. 3A-B, 13A-B).

With respect to claim 2, the method of Kamata further includes: providing a mask (30, 360) over the portion of the magnetic thin film (20) to be preserved using photolithography.

With respect to claim 5, the fluorine-based reactive plasma of Kamata CF_4, SF_6, CHF_3.

With respect to claim 6, the pressure used in the converting of Kamata is within a range of about 10 mT to about 30 mT.

With respect to claim 7, the portion of the magnetic thin film (20) of Kamata comprises of alloys of nickel, iron, and cobalt, and the converting comprising converting the alloys of nickel, iron, and cobalt, to a fluorine-containing film.

With respect to claim 8, the fluorine-containing film (40) is non-ferromagnetic.

With respect to claim 9, the fluorine-containing film (40) of Kamata is non-magnetic.

With respect to claim 10, the fluorine-containing film (40) of Kamata is electrically insulating.

With respect to claim 11, the mask (30) of Kamata comprises a photoresist.

With respect to claim 13, the method of Kamata further includes: producing a magnetic device.

With respect to claim 14, the using chemical transformation of Kamata can be performed at room temperature.

With respect to claim 15, the reactive plasma of Kamata includes a fluorocarbon.

With respect to claim 17, the reactive plasma of Kamata includes sulfur hexafluoride.

With respect to claim 19, the pressure of Kamata is selectively employed for the plasma sputtering such that the magnetic thin film material (20) is substantially free of erosion.

With respect to claim 22, the mask of Kamata comprises an insulating hard mask (360), the method of Kamata further includes: after the converting, selectively etching the insulating hard mask (360) to pattern the insulating hard mask.

With respect to claim 23, the method of Kamata further includes: forming a conductive material (380) over the area where the insulating hard mask (360) was etched.

With respect to claim 24, the reactive plasma of Kamata includes a fluorine-containing gas.

With respect to claim 25, the magnetic thin film (20) of Kamata includes a magnetic tunnel junction (MTJ), and wherein after the converting portion, the edges of the magnetic tunnel junction have no exposure to oxygen. (see Figs 13).

With respect to claim 26, the edge smoothness of the MTJ of Kamata is inherently determined by a line edge roughness of the mask (360).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kamata '192 as applied to claim 2 above, and further in view of Ning et al. (U.S. Pub. No. 2002/0098676) of record.

With respect to claim 12, Kamata teaches providing a mask over a portion of the magnetic thin film for patterning.

Thus, Kamata is shown to teach all the features of the claim with the exception of utilizing a metal hard mask.

However, Ning teaches utilizing photolithography to provide a mask including TaN, TiN (244) for patterning.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to provide a hard mask of Kamata including a TiN and TaN as taught by Ning for patterning over the portion of the magnetic thin film.

7. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kamata as applied to claim 1 above, and further in view of Baglin et al. (U.S. Patent No. 6,331,364) of record.

Kamata teaches converting a portion of a magnetic thin film by a reactive plasma.

Thus, Kamata is shown to teach all the features of the claim with the exception of using argon for the reactive plasma.

However, Baglin teaches other ion species that may be used to converting a magnetic thin film including argon. (See col. 10, lines 9-13).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention was made to convert a portion of the magnetic thin film of Kamata utilizing argon plasma as taught by Baglin to achieve the desired chemical conversion.

8. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kamata '192.

Kamata teaches converting a potion of the magnetic thin film (20) into non-magnetic insulating (40).

Thus, Kamata is shown to teach all the features of the claim with the exception of explicitly to include bromide.

However, Kamata teaches the reactive gas containing halide. It is well known that bromide in a member of halide gas.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to converting a portion of the magnetic thin film of Kamata utilizing bromide, since bromide as well as iodide, fluoride or chloride are member of reactive gas known as halide.

9. Claims 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamata '192 as applied to claim 1 above, and further in view of Chen et al. (U.S. Patent No. 6,165,803) of record.

With respect to claim 20, Kamata teaches converting a portion of magnetic thin film (20) by reactive plasma.

Thus, Kamata is shown to teach all the features of the claim with the exception of further process step.

However, Chen teaches process steps following the conversion including:

forming an insulating layer (72) over the converted portion (42b) of the magnetic thin film (42) and the mask (52); and

etching the insulating layer (72) and the mask (52) to planarize the upper level of the mask (52) and the insulating layer (72). (See Fig. 12).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention was made to further process the converted magnetic thin film of Kamata utilizing the further process step as taught by Chen to form the MTJ device.

With respect to claim 21, the method of Chen, further includes:

selectively etching the mask (52); and forming a conductive material (70) over the insulating layer (72) and the area where the mask (52) was selectively etched. (See Fig. 13).

Response to Arguments

10. Applicant's arguments filed July 10, 2006 have been fully considered but they are not persuasive.

Applicant argue that Kamata does not teach or suggest transforming a portion of the magnetic thin film to be non-magnetic and electrically insulating using a chemical transformation, said chemical transformation comprises a fluorine-based reactive plasma, as recited in exemplary claim 1.

However, it is apparent that the Applicant fails review the Kamata '192. At the least, the Applicant should read the abstract and [0181].

Applicant further adds: Kamata, however, does not mention insulative properties, let alone teach or suggest that the thin film is electrically insulating.

Despite the fact that Kamata already teaches about electrically insulating, see [0181], the method of Kamata is transforming a magnetic thin film using chemical transformation comprises fluorine-based reactive plasma. By performed the same process, fluorine-based reactive plasma, on the same material, magnetic thin film, the final product, insulating, is an inherent result.

The claims are fully anticipated by Kamata, the rejection is maintained.

ABOUT THE FORMAL MATTERS:

With respect to claim 13, Applicant fails to provide evidence that the device formed in claim 13 is any different from that of claim 1.

What is the magnetic device that is differed from the device formed in claim 1 ?

Conclusion

11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh D. Mai whose telephone number is (571) 272-1710. The examiner can normally be reached on 8:00AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ANH D. MAI
PRIMARY EXAMINER